Global Journal of Health Science; Vol. 6, No. 6; 2014
ISSN 1916-9736 E-ISSN 1916-9744
Published by Canadian Center of Science and Education

Assessment of Vitamin K2 Levels in Osteoporotic Patients: A Case Control Study

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Received: April 29, 2014 Accepted: June 23, 2014 Online Published: July 15, 2014

doi:10.5539/gjhs.v6n6p82 URL: http://dx.doi.org/10.5539/gjhs.v6n6p82

Abstract

Objective: The aim of this study was to measure the level of Vitamin K2 (Vit K2) in osteoporotic patients and individuals with normal bone density as controls.

Materials and Methods: This case-control study was done in Outpatient Department of Rheumatology at Qazvin Boo-ali Sina Hospital in 2013. Participants were 50 patients with osteoporotic densitometry measured by DEXA (T score≤ -2.5) who were matched with 48 persons in control group with normal bone density (T score> -1). The level of Vit K2 in samples was measured using enzyme linked immunosorbent assay (ELISA). Data were analyzed by Mann-Whitney U test and Chi-square test.

Results: The level of Vit K2 in patients with osteoporosis was not significantly different from the control group (Median: 75.95 vs. 71.35 nmol/L, respectively; P-value: 0.709). The authors determined cut-offs 75 percentile of vitamin K2 in all participants that was 85 nmol/L and percentages of persons in two groups were similar.

Conclusion: Although Vit K2 level in patients with osteoporosis was not significantly different from the control group, further studies are necessary to confirm the association of osteoporosis and Vit K2.

Keywords: bone densitometry, normal bone density, osteoporosis, vitamin K2

1. Introduction

Vitamin K (Vit K) is a fat soluble vitamin which is categorized to, phylloquinone (K1), menaquinones (K2) and Menadione (K3) (Plaza & Lamson, 2005). Phylloquinone (K1) family, also known as phytonadione based on relation to photosynthesis, is well known. The resources of Vit K1 are higher plants and green leafy vegetables (Shearer, 1995). Menaquinones (K2) produced naturally in a production series by intestinal bacteria and, not by higher plants (Plaza & Lamson, 2005).

Vit K deficiency is uncommon in healthy adults because: 1) Vit K is widespread in foods, 2) the Vit K cycle conserves it; and 3) bacteria in the large intestine usually synthesize menaquinones (Vitamin K2), but it is unclear whether significant amounts of produced Vit K2 are absorbed and utilized. The risk of Vit K deficiency is increased in patients who are taking Vit K antagonist like anticoagulant drugs, and individuals with significant liver damage or disease (Olson, 1999). As well, individuals with fat malabsorption disorders may be at higher risk of Vit K deficiency (Ferland, 2006). Exogenous Vit K is required for carboxylation of osteocalcin, which in turn allows osteocalcin to bind to hydroxyapatite mineral. A Vitamin K2 (Vit K2) preparation (menatetrenone) is widely used for treatment of osteoporosis in Japan (Rosen & Drezner, 2014). Observational data suggest that low vitamin K consumption or impaired Vit K status may be associated with an increased risk of fracture in elderly (Feskanich et al., 1999; Booth et al., 2004).

Seven clinical trials in Japan (primarily on postmenopausal women with osteoporosis) reported fracture data; and then used menaquinone for prevention of osteoporotic fractures. After administration of Vit K2, significant decrease was seen in vertebral, hip, and all non-vertebral fractures (Brar, 2010). It must be considered that these reports are only in Japanese women, who may have significant dietary differences from other countries (Brar, 2010). The aim of this study was to measure the levels of Vit K2 in individuals with normal bone density and osteoporotic patients.